

CLAIMS

1. A system for web inspection of a web, the system comprising:

- 2 a plurality of smart cameras, each smart camera for detecting a plurality
 of web flaws from a streaming video signal, each smart camera
4 having means for generating flaw image data and flaw location
 data;
6 a host computer for controlling the low contrast web inspection system
 and for accepting and displaying the flaw image data and the flaw
8 location data; and
 an ethernet for connecting the plurality of smart cameras to the host
10 computer.

2. The system of claim 1, wherein each smart camera of the plurality of smart
2 cameras comprises:

- a line scan camera for generating a pixel representation of a portion of
4 the web;
 a lighting uniformity and pixel sensitivity correction means for correcting
6 each pixel of the pixel representation and for providing a corrected
 pixel representation;
8 a web edge detector for detecting at least one edge of the web;
 a multi-pipeline pre-processor for filtering the corrected pixel
10 representation, the multi-pipeline preprocessor generating a
 prioritized data stream of potential flaws;
12 a run length encoder for generating location data regarding a location of
 each group of the potential flaws in a cross direction;
14 a blob detector for generating block data regarding the location of blocks
 of the potential flaws along a machine direction; and
16 an inspect/reject analyzer for determining actual flaw data from the
 prioritized data stream of potential flaws.

3. The system of claim 2, wherein the multi-pipeline processor comprises:

- 2 a plurality of filters for averaging the corrected pixel representation over
a distance of the web along a machine direction of the web;
- 4 a plurality of adaptive background subtraction channels connected to the
plurality of filters;
- 6 a plurality of thresholds, each thresholder of the plurality of thresholds
connected to an output of an adaptive background subtraction
8 channel of the plurality of adaptive background subtraction
channels, each thresholder for grouping a subtracted pixel
10 representations; and
- 12 a priority logic circuit for prioritizing the outputs of each of the plurality of
thresholders.

4. The system of claim 3, wherein the plurality of filters comprises:

- 2 a background filter;
- a machine direction streak filter;
- 4 a cross direction streak filter; and
- a small flaw filter.

5. The system of claim 3, wherein the plurality of thresholds comprises:

- 2 a single pixel flaw detector;
- a uniformity detector;
- 4 a machine direction streak detector;
- a cross direction streak detector; and
- 6 a small flaw detector.

6. The system of claim 1, wherein each smart camera of the plurality of smart
2 cameras detects the plurality of web flaws from the streaming video signal at a
contrast approaching a signal noise level.

7. A method for low contrast web inspection of a web, the method comprising
2 the steps of:

providing at least on smart camera for inspecting at least a portion of the

4 web;

generating flaw image data and flaw location data;

6 transmitting the flaw image data and flaw location data over an ethernet;

displaying the flaw image data and flaw location data.

8. The method of claim 7, wherein the step of generating flaw image data and
2 flaw location data comprises the steps of:

generating a pixel representation of a portion of the web;

4 correcting the pixel representation for a lighting uniformity and a pixel
sensitivity;

6 filtering the corrected pixel representation utilizing a plurality of filters;

grouping the filtered corrected pixel representations to generate a
8 plurality of potential flaw data streams;

generating a prioritized data stream from the plurality of potential flaw
10 data streams;

generating cross direction location data regarding a location of the
12 prioritized data stream;

generating block data regarding the location of blocks of the prioritized
14 data stream along a machine direction; and

determining actual flaw data from the prioritized data stream of potential
16 flaws utilizing the cross direction location data and the block data.

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9. A method for generating a prioritized image data stream from a digitized
video stream of a web, the method comprising the steps:
averaging the digitized video stream over a distance of the web to
generate an averaged background signal;
averaging the digitized video stream over a distance of the web along a
machine direction of the web to generate a filtered machine
direction signal ;
averaging the digitized video stream over a distance of the web along a
cross direction of the web to generate a filtered cross direction
signal;
subtracting the averaged background signal from the filtered machine
direction signal to generate a first pixel representation;
subtracting the averaged background signal from the filtered cross
direction signal to generate a second pixel representation;
grouping the first and second pixel representations to generate at least
two data streams of potential flaws; and
prioritizing the at least two data streams of potential flaws to generate the
prioritized image data stream.